SIEMENS

MOBILETT Plus HP

SP

Installation and Setting Instructions

From Serial No. 30800

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Training of customer support engineers

Due to the technology, used in this equipment, the setup, service and maintenance is only allowed to be performed by a customer support engineer with a Work Permit for MOBILETT Plus HP.

Text emphasis

⚠DANGER	**DANGER indicates when there is an immediate danger that leads to death or serious physical injury.**
⚠WARNING	**WARNING indicates a risk of danger that may lead to death or to serious physical injury.**
⚠CAUTION	**CAUTION used with the safety alert symbol indicates a risk of danger that leads to slight or moderate physical injury and/or damage to property.**
NOTICE	**NOTICE used without the safety alert symbol indicates a risk of danger that if disregarded leads or may lead to a potential situation which may result in an undesirable result or state other than death, physical injury or damage to property.**
NOTE	**NOTE contains information provided with special emphasis to facilitate proper use of the equipment or proper execution of a procedure, i.e. hints, tips.**

Symbols

Checks and adjustments that must be performed with radiation ON are identified by the radiation warning symbol.

This symbol means "Dangerous voltage".

This symbol means "Attention, consult the documentation".

U
S
A

Several of the sections in these instructions are for the USA only. These sections are identified with this symbol.

This symbol indicates components sensitive to Electro-Static Discharge (ESD).

Checks marked with this symbol are to be entered into the test certificate at the end of these instructions.

Required documents

- Instructions for Use SPR8-220.201...
- Service Instructions SPR8-220.061...
- Installation Instruction SPR8-220.031.02...
  Remote exposure switch system-optional

USA
- Maintenance Instructions including DHHS... SPR8-220.101...

Required tools, measurement and auxiliary devices

NOTE

All tools, measurement and auxiliary devices with the exception of those marked " * " , are listed along with their specifications in the STC (Service Tools Catalogue).

- Standard service equipment*
- Digital multimeter
- kV measurement device (works with the filter comparison method)
- Protective ground/earth meter
- Equivalent leakage current meter

USA
- Storage oscilloscope with ± 2.5 % accuracy

USA
- Dose meter

Safety information and protective measures

⚠CAUTION

- **When performing service work and tests adhere to:**
  - **the product-specific safety information in the documents,**
  - **as well as the general safety information contained in ARTD Part 2.**
- **Connect the MOBILETT Plus HP only to mains power supply outlet (receptacle), that corresponds to the installation requirements of VDE 0107 or country-specific regulations.**
- **Remove or install boards only when the generator is switched OFF. Adhere to the ESD guidelines .**
- **Checks and adjustments performed with radiation ON are identified by the radiation warning symbol . During these types of adjustments, radiation protective clothing must be worn.**

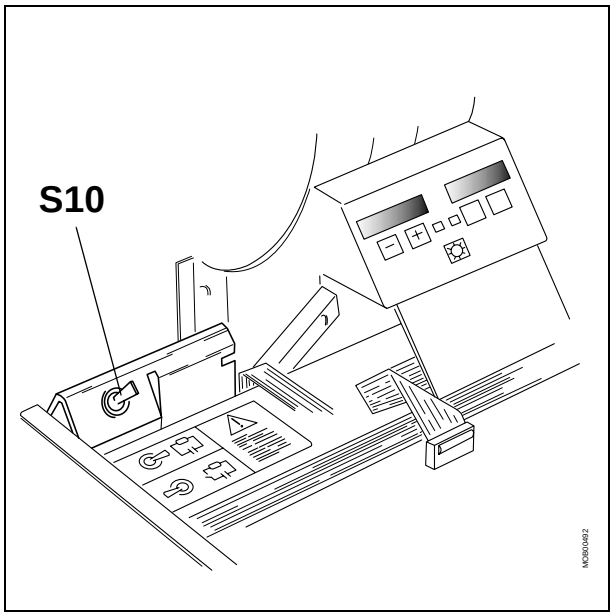


Fig. 1

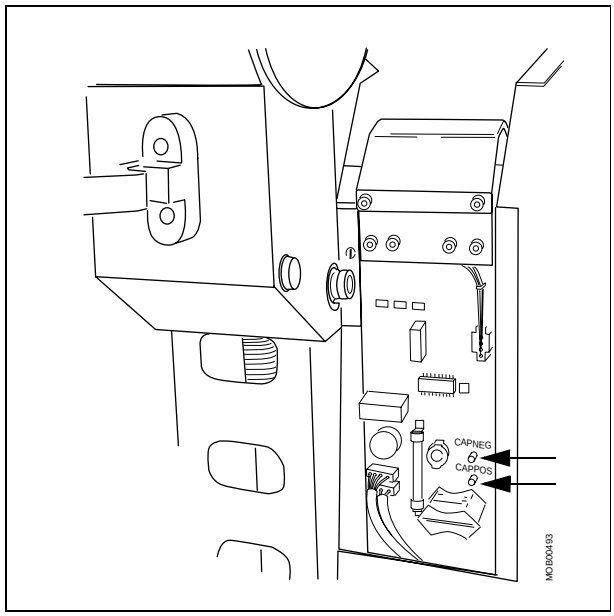


Fig. 2

Protective measures batteries B10 and capacitors in power conversion unit M10 and M11

Comply with the information given in this section, before opening the system.

⚠DANGER

High Voltage!

Life-threatening electric shock hazard exists. Never work with the system open if the batteries are still connected and the capacitor is charged. If the batteries are connected, the complete system is powered on!

The capacitors in M10 and M11 may still be charged even if the system is switched OFF and the mains cable is disconnected. The capacitors in M10 and M11 must be considered charged until the protective measures listed in this section have been performed.

- System OFF (turn the main switch to **C**).
- Disconnect the mains cable.
- Remove the system upper cover.
- Discharge the capacitors in M10 and M11 with S10 (D7) (refer to Fig. 1).
- Wait 5 minutes; then remove the left and right covers, and the cover with the cassette compartment.

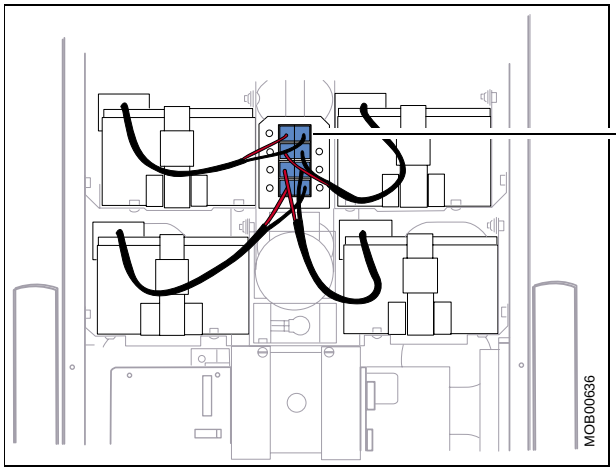


Fig. 3

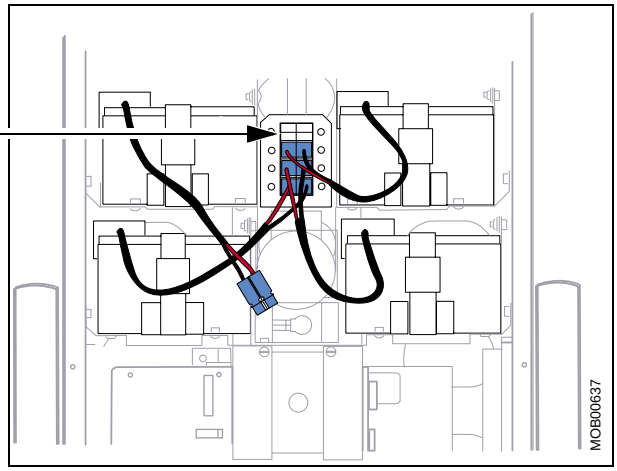


Fig. 4

- Disconnect batteries by removing one of the KBATT plugs (refer Fig. 3 and Fig. 4).
- Measure the residual voltage at test points CAPPOS and CAPNEG on board D7 (refer to Fig. 2). The voltage measured must be less than 2 VDC.

⚠WARNING

If the voltage measured between CAPPOS and CAPNEG is 0V, the measurement device could be defective or the wires between the CAPPOS and CAPNEG test points on the capacitor bank could be damaged.

The capacitors could still be charged.

In this case, proceed as follows:

- Make sure that the correct measurement range is set on the measurement device.
- Connect the measurement device to CAPPOS and CAPNEG.
- Switch S10 off. Connect the mains cable and switch the system ON.
- Check whether the voltage increases.
- Switch the system OFF, disconnect the cable and switch S10 on.
- Check whether the voltage decreases.

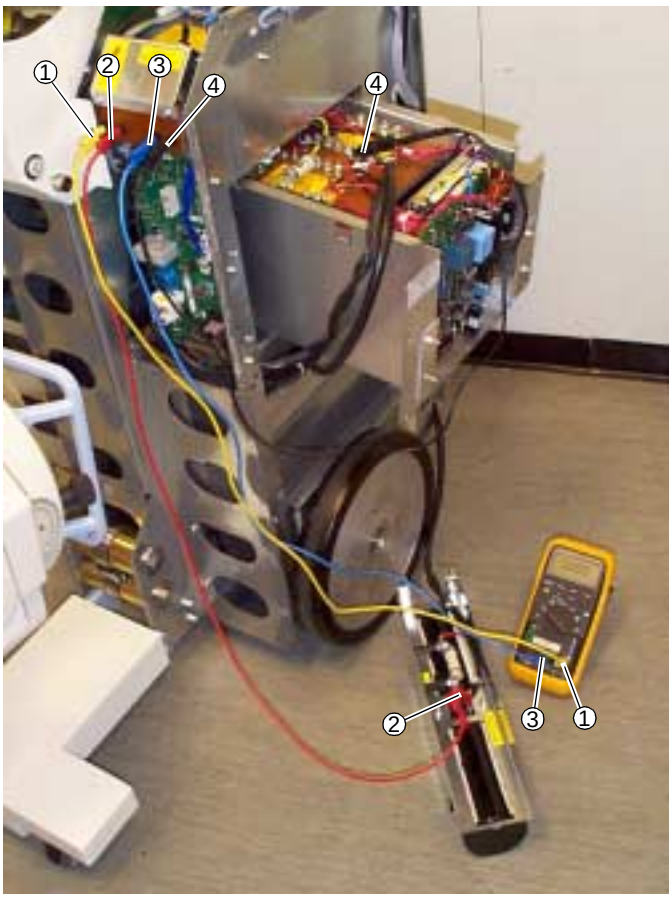
⚠WARNING

If U11 or U301 is blown the capacitor in M11 will not be discharged with S10.

The capacitors could still be charged.

Verify that U11 or U301 has not blown.The capacitor in M11 must then be discharged as stated below.

- Measure the voltage on the capacitors in M11 and check that the voltage level is <2 V DC. If not, discharge the capacitors with R103, see 1.



① Left connector on D7 to the + connector of the digital multimeter
② Second left connector on D7 to the fuse-side (U11) next to the capacitor
③ Second right connector on D7 to the - connector (GND) of the digital multimeter
④ Right connector on D7 to the P11 connector on the power conversion unit (M10)

Fig. 5

⚠WARNING

If the charging/discharging does not function, the power conversion unit M10 and M11 must be considered “charged”.

This means a risk of high voltage.

Use caution when performing measurements at the capacitors in M10 and M11.
Use only the specified measurement devices (350 V DC).

General information

The MOBILETTs are mobile, mains-supplied X-ray units for intensive care units, neonathal departments and general X-ray rooms.

All exposure values can be chosen with free adjustment of kV and mAs data.

After start-up, country-specific tests are to be performed, if required; e.g. acceptance test according to RöV (Germany-X-ray ordinance).

Acceptance test according to RöV (Germany):
Required measurements can be partially transferred from the test protocol provided.

Supply schedule

1 crate:	L = 1360 mm
	B = 780 mm
	H = 1860 mm

Weight: gross approx	MOBILETT Plus HP	370 kg

(Technical documents enclosed)

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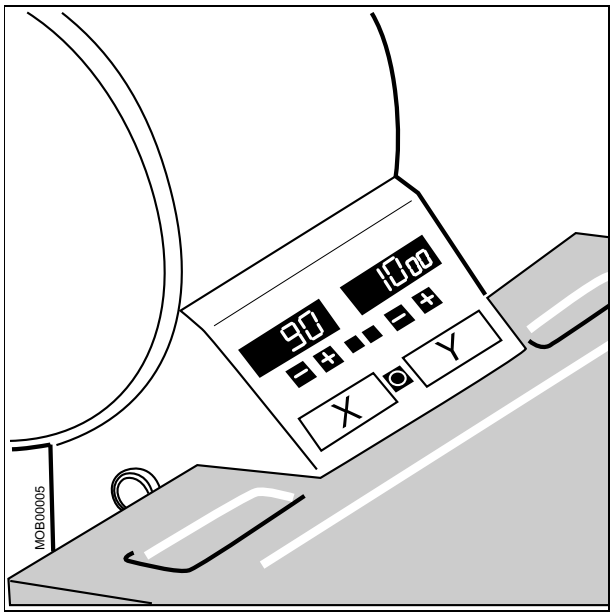


Fig. 1

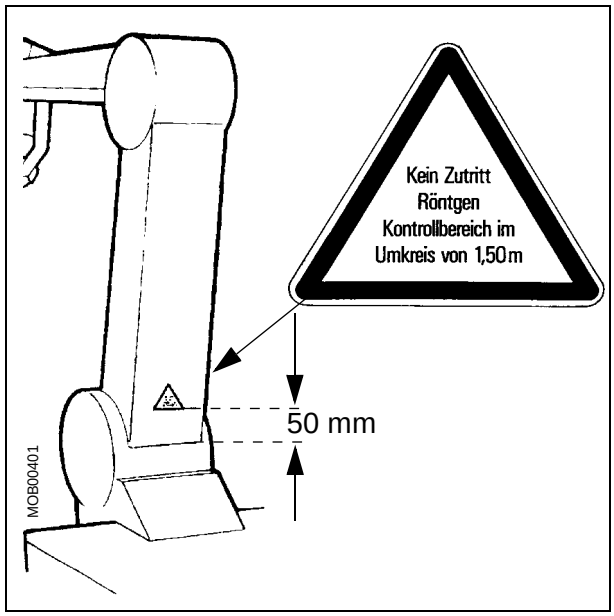


Fig. 2

Unpacking, applying warning labels

⚠WARNING

Important when unpacking:

Risk for serious damages due to humidity condensation or to high temperature inside the batteries.

Assure that the unit has established normal room temperature. The single tank temperature must be >15°C before startup.

- Fill in the LINA cards and return them to the addresses stated in the instructions on the cards.
- Unpack the protractor and place it on a proper place e.g. the column.
- Connect the exposure release cable.
- Mount warning label 60 77 411. Choose appropriate language version and paste it/them on the Control and display panel according to X, Y / Fig. 1.
- Only in Germany:
  Mount label 96 33 645 on the lower arm 50 mm above the link, see Fig. 2.

NOTE

If, due to increased operating loads (DIN 6815), there are other dimensions on site for the control range, appropriate labels can be ordered:

- **Control range: 2.5 m, Part No. 84 14 823**
- **Control range: 3.5 m, Part No. 31 36 731**

•

NOTE	**The following labels come in different languages. Pick the proper ones and paste them according to Fig. 3.**

Mount the main switch label 65 90 827 next to the mains switch as shown in Fig. 3. The main switch label comes in different languages.
Then mount the other warning label 65 84 606 as shown in Fig. 3.

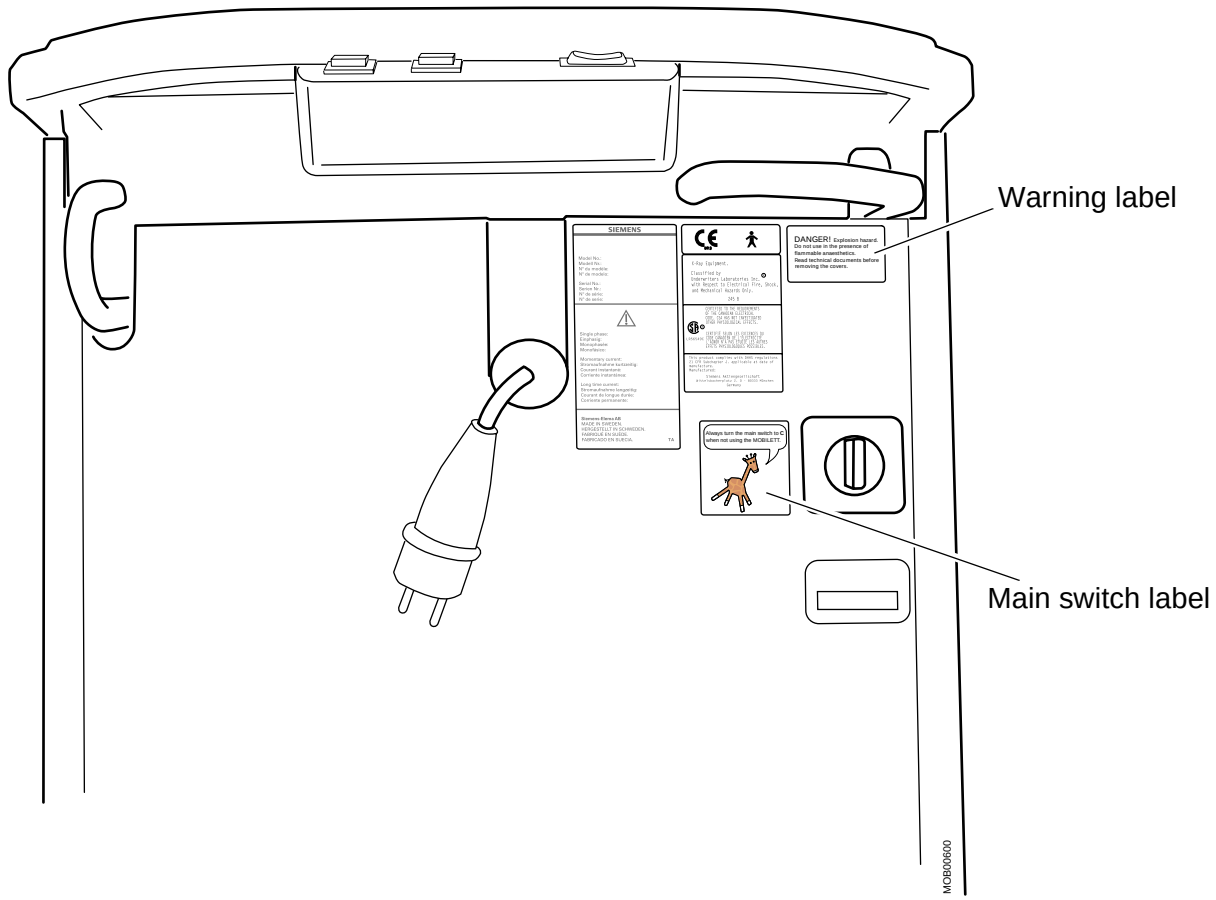


Fig. 3

- Check the unit for cracks, fractures or other damages.
- Make sure that neither the single tank nor the collimator has any mechanical defects which would impair the radiation protection.

This unit is provided with a 110 V hospital grade plug or a 230 V European plug. If the unit will be operated with a different plug, the plug can be exchanged for a local standard grounding/earthing plug. For USA and Canada an UL/CSA approved mains cable and plug is installed.

If the operating voltage is changed from 110 V to 230 V or vice versa, the mains fuses U9 and U10 must be exchanged:

100 V - 130 V = 15 A

200 V - 240 V = 10 A

Only use approved types of fuses, see Spare part list.

USA

DHHS checks

The following measurements must be done according to "Maintenance Instructions including DHHS requirements".

- mAs accuracy
- Reproducibilty

Labels

See Instructions for Use for adequate labeling.

Charging of batteries

Connect the power supply plug and switch the main switch to position "C" (battery charging). The batteries will now be charged automatically.

- Check the battery indicator for full.

  ➪ If not, charge the batteries.

NOTE	**Battery charging time from completely empty to full is 12 hours.**

Formation status for capacitors

Initialization and capacitor formation selftest

- Switch the main switch to position "M" (mains power).

  ➪ The MOBILETT runs a formation selftest during startup.

NOTICE	**If the formation status is OK, the "Ready" light indicator lights up in approximately 2 minutes. Continue with chapter "Function check".** **If error message "CAL 19" or "Err 17" appear on the display, see chapter "Capacitor formation".**

Function check

If a maIfunction occurs a message is indicated at the display, see "Service Instructions, chapter Display messages".

Functional test cable winder

- Disconnect the power supply plug.
- Pull the left handle (for the cable winder) upwards.
- Move the cable up and down while rewinding it, in order to avoid any slack, until the cable is completely rolled up. Check proper function of cable winder and brake.
- Pull out the cable and connect the power supply plug.

Functional tests with motor drive

- Test the forward/ reverse and fast (1 m/s) / slow (0.5 m/s) controls.

NOTE	**For adjustment, see chapter "Speed Adjustment".**

Speed Adjustment (if necessary)

- Remove the plastic plug above and to the left of the supporting wheels on the cover with the cassette compartment (for details see the Service Instructions).
- Use a screwdriver and adjust the speed by potentiometer on D101:
  - turn clockwise (CW) for slower speed.
  - turn counterclockwise (CCW) for faster speed.

NOTE	**This will effect the slow/fast speed simultaneously.**

Capacitor formation (if necessary)

- Remove the system upper cover
- Switch "1" of S1 on D1 to "ON".

➪ This will display the program version:
kVmAs
vErX.X = Version X.X (depends on software version installed).

- Select test programs by pressing "kV+" button until "P06" is displayed.
- Press lamp button to start the capacitor formation.

➪ The test program starts with displaying:
kVmAs
CAPFor = Capacitor formation program

➪ After a short while, starts the program to display the actual voltage in the capacitor bank:
kVmAs
CAP150 = 150 Volt.

Approximately every 6 minute the voltage values is increased. The charging sequence is increased as follows:

➪ 150 - 250 - 299 - 325 - 337 - 345 - 348 - 351 - 353

At the 353 V level the charging will continue for another 48 minutes to decrease and stabilize the capacitors internal leakage current.

➪ If the formation is successfully finished the display will show:
kVmAs
P06 PASS = Capacitor formation completed.

Duration: Approximately 100 minutes.

- Switch "1" of S1 on D1 to "OFF"

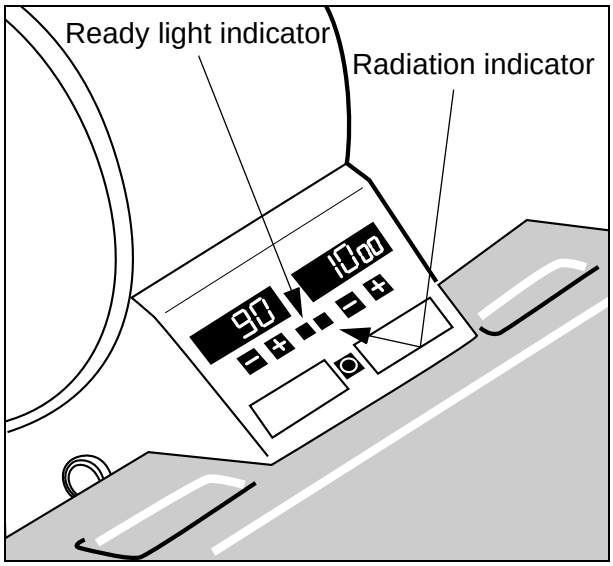


Fig. 4

Check the indicators and control buttons

kV and mAs indication, technique factors

- Switch the main switch to position "B" (battery power).
- Select kV or mAs values by pressing the appropriate buttons. These values are indicated at the display. When changing the kV values, the "Ready" light indicator sometimes goes out while the generator adjusts to the new kV values.

NOTE	**Pressing the button briefly increases/decreases the exposure value by one step. Holding the button depressed results in a continuous increase/decrease.**

Radiation indicators

- Select 81 kV and 10 mAs.
- Make an exposure and confirm that the X-ray control console provides a visual indication whenever X-rays are produced and that a signal audible to the operator is present indicating that the exposure has been terminated.

Manual termination of exposure

The operator shall be able to terminate the exposure at any time during an exposure.

- Select: 70 kV, 160 mAs
- Make an exposure and immediately interrupt the exposure with the exposure release switch. A message, "USE 20", appears on the display indicating that the exposure release switch was released during exposure. It will also be indicated by 10 short beeps. The message can be acknowledged by pressing the kV + button.

Remote exposure switch system (optional)

- Check the function of the remote exposure switch system according to chapter functional check of "Installation Instructions: Installation of remote exposure switch system".

Test of kV-accuracy

Requirement:

- The measured kV values, shall be within the limits.

Required measurement devices:

- kV-meter, based on the filter-comparison method, for example PTW-Nomex kV meter. When measuring the kV non invasive a correction factor from the user manual of the kV-meter has to be used. If a kV meter is not available and if it is within local laws and regulations, the measurement can be made with an oscilloscope on D1. KVPEAK - D1 GND with a result of 40 kV/V.

NOTE	**Higher filtration results in higher kV values.**

- For the actual filtration of this MOBILETT, see the test protocol.

If the actual inherent filtration is unknown, the correction shall be made with a reference value of 5 mm Al.

- Put the kV meter into operation, see operating instructions for the kV-meter.
- Place the measurement detector on a table or other. Using the light field, set the detector in the beam projection, see Fig. 5.
- Set the SID to approx. 50 cm (20"). The SID may vary between different kV-meters.

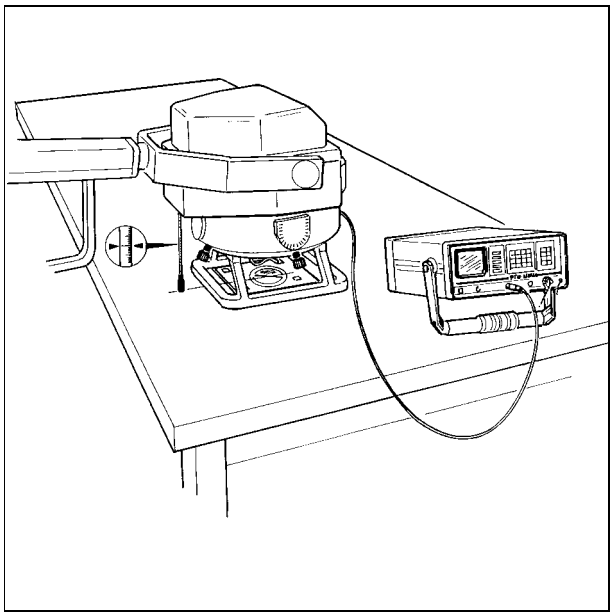


Fig. 5

- Set the following exposure parameters and release exposure:

kV Meter selection	Exposure parameter		Limit values* to be maintained
DC voltage	52 kV	50 mAs	49.0 - 55.0 kV
	81 kV	20 mAs	77.0 - 85.0 kV
	133 kV	12.5 mAs	126.4 - 139.6 kV

* The measurement inaccuracy of the respective measurement device must be subtracted from these limit values.

- Connect the power supply plug and switch the main switch to position "M"
- Set the following exposure parameters and release exposure:

kV Meter selection	Exposure parameter		Limit values* to be maintained
DC voltage	81 kV	20 mAs	77.0 - 85.0 kV

- Disconnect the power supply plug, roll up the cable and switch the main switch to position "B".

Check the arm- and single tank movement

- Check the arm systems and the single tanks up and down movements. The arm and the single tank should be easy to move and remain in desired positions. If this is not the case, see "Service Instructions, section Adjusting the friction linings".

Adjustment, kV steps and upper kV / mAs limits

If the customer or local regulations asks for a limitation of the upper kV / mAs value, the service program P14 and / or P15 have to be executed. Program P14 is also used to set the kV steps to either 25 individual steps from 40 - 133 kV in whole exposure points, or 49 individual steps from 40 - 133 kV in half exposure points.

- Select Service Mode according to chapter "Capacitor formation".
- Select P14 (for kV steps and upper kV limit) or
  Select P15 (for upper mAs limit).
- Press lamp button to display actual kV limit / mAs limit.
- Press kV / mAs +/- button to change value.
- Press lamp button to store value and leave program.
- Switch "1" of S1 on D1 to "OFF".
- Check the chosen values.

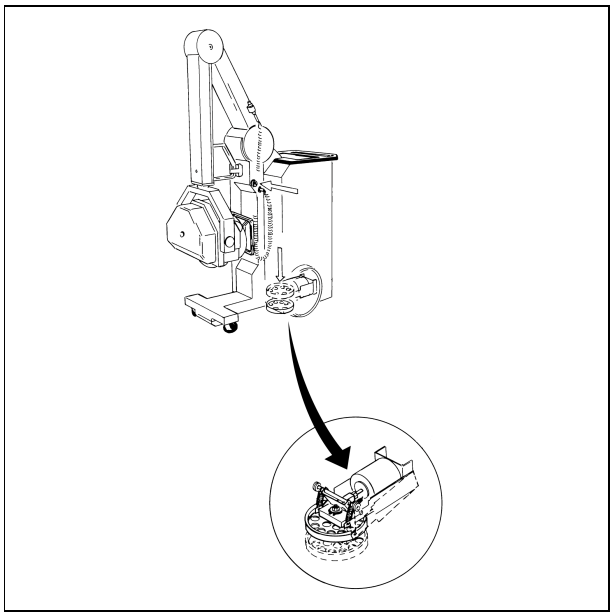


Fig. 6

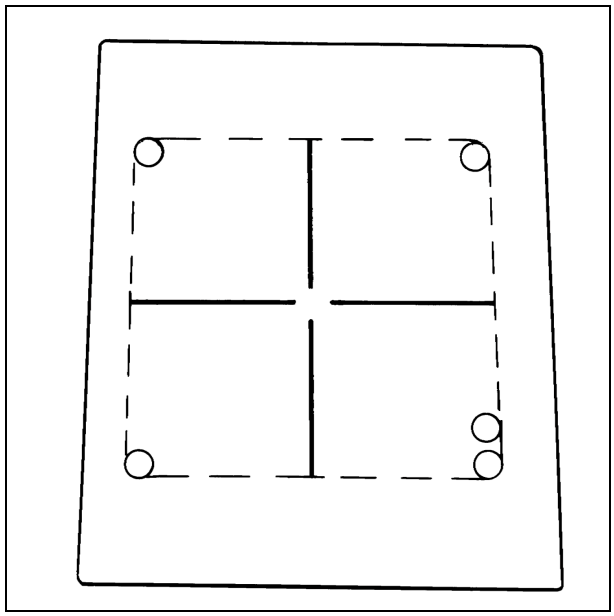


Fig. 7

Check the turn plate

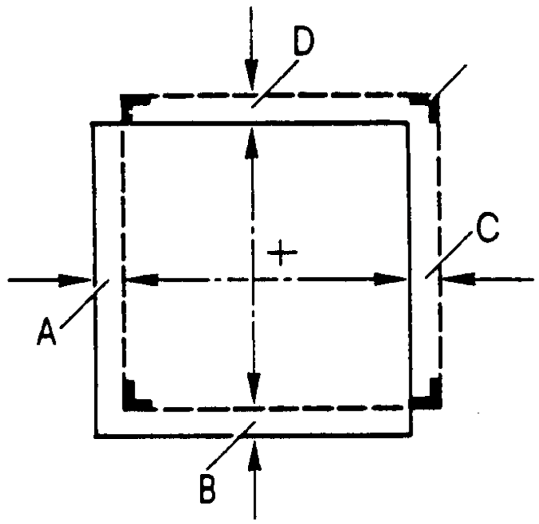
- Push one of the turn plate buttons. The buttons must be lit when the turn plate is activated.
- Check that the unit can rotate around the turn plate, see Fig. 6.
- Push the turn plate button again and check that the turn plate goes back in parking position.
- Repeat the check with the other turn plate button. If any problem occurs, see "Service Instructions, section Adjustment and replacement of the turn plate".

Check the brake

- Lock the brake. It should not be possible to move the MOBILETT with normal hand effort. A slight skip is acceptable when using a force, greater than 350N.

Check the light field to X-ray field

- Load a 35x35 cm (14"x14") cassette with film.
- Put the cassette on a table or a similar repository.
- Set a SID of 100 cm (39"). Use the measuring tape.
- Switch on the collimator lamp and align the cassette. Now, collimate the light field to 25 x 25 cm (10"x10").
- Mark the four corners with coins and mark one of the corners with two coins, see Fig. 7.
- Set 52 kV, 2.0 mAs on the Control and display panel.
- Trigger an exposure.



$\frac{A+C}{SID} \leq 1{,}7\ \%$

$\frac{B+D}{SID} \leq 1{,}7\ \%$

- - - - - - - - = Light field

———— = X-ray field

SID = Source image distance

Fig. 8

- Process the film and measure the deviation between the light field and the X-ray field. Permissible deviation ±1.7 % of the SID, see Fig. 8.
  If the deviation is greater, see "Service Instructions, chapter Replacement and repairs on the collimator".

Measurement of protective ground wire

Measuring instruments required: test instrument for protective ground wire

- Measure protective ground wire according to ARTD-002.731.17... "Safety regulations for installation and maintenance".

Resistance of protective ground wire ≤ 0.2 ohms.

Measurement of substitute leakage current

Measuring instruments required: test instrument for leakage current.

- Measure the substitute leakage current according to ARTD-002.731.17... "Safety regulations for installation and maintenance".

Value first measured

When the substitute leakage current is measured, a first measurement and so-called repeat measurements are carried out. It is the purpose of these repetitions to detect as early as possible any deviations from the value "first measured" and consequently changes in the safety structure of the system.

In the measurement of the first value, the **permissible maximum value of 2 mA** must not be exceeded.

The value "first measured" has to be entered in the test certificate at the end of the installation and setting instructions.

Repeat measurements

After a repair - if this becomes necessary due to the work performed - and basically always after maintenance, the substitute leakage current has to be measured again.

The value measured must not exceed the permissible maximum value of 2 mA. In addition, the value first measured must not be exceeded by more than 50%.

The results have to be documented.

List of compatible components

Component	Part No.
Single tank (new)	60 77 379 X037E
Single tank (repaired)	61 85 172 X037E
Collimator (new)	63 17 775 X037E

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This test certificate is subdivided by analogy to installation and adjustment instruction. This test certificate shall be completed in duplicate, one copy remaining with the client, the other to be filed at the branch office.

Part No./Type No./Serial No.: .....

Customer: ..... **Customer No:** .....

Site/System Designation: .....

- ❒ Unpacking, Warning labels
- ❒ Labels
- ❒ Battery indicator
- ❒ Initialization selftest
- ❒ Capacitor formation (Formation program used)
- ❒ Functional tests with motor drive
- ❒ kV and mAs indication, technique factors
- ❒ Radiation Indicators
- ❒ Manual termination of exposure
- ❒ Remote exposure switch system
- ❒ Test of kV-accuracy

Main switch	Exposure values	Measured kV
B	52 kV / 50 mAs	.....
B	81 kV / 20 mAs	.....
B	133 kV / 12.5 mAs	.....
M	81 kV / 20 mAs	.....
Measurement device	Type:	
	Serial No.:	
	Date calibrated:	

USA

- ❒ Test of mAs-accuracy

Main switch	Exposure values	Calculated mAs
B	40 kV / 5 mAs	.....
B	81 kV / 2 mAs	.....
B	133 kV / 10 mAs	.....
M	81 kV / 2 mAs	.....
Measurement device	Type:	
	Serial No.:	
	Date calibrated:	

U
S
A

❒ Check for reproducibility

Fluctuation coefficient C: .....

Measurement device

Type: .....
Serial No.: .....
Date calibrated: .....

❒ Check the arm- and single tank movement

❒ Check the turn plate

❒ Check the brake

❒ Light field relative to the x-ray field

$\frac{(A+C)x100\%}{SID}$ = ... %

$\frac{(B+D)x100\%}{SID}$ = ... %

❒ Protective ground: ..... Ω

Measurement device

Type: .....
Serial No.: .....
Date calibrated: .....

❒ Substitute leakage current: ..... mA

Measurement device

Type: .....
Serial No.: .....
Date calibrated: .....

Date: ..... Technician: .....